

# DØ Detector and Operations Status

- Tevatron performance
- DØ performance
- DØ Control Room
- Data Monitoring
- DAQ improvements
- Online/Control Systems
- Detector Status
- Ignore most of the trigger issues...

**Leslie Groer**

**Columbia University, New York**

**DØ Collaboration Meeting**



**April 24, 2002**

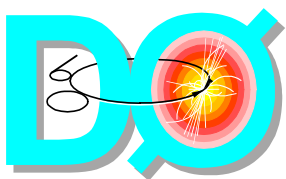


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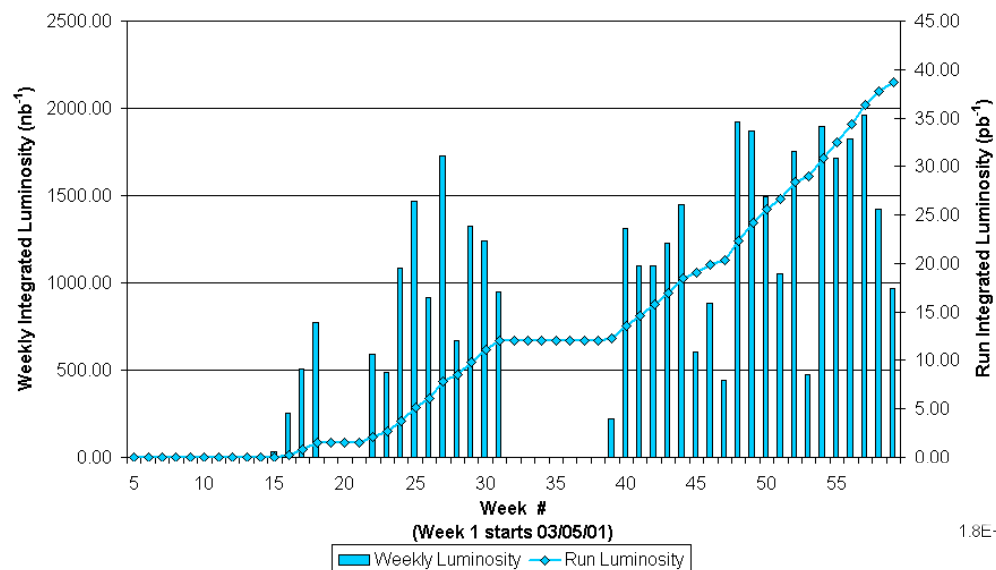
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# Tevatron Performance

Collider Run IIA Integrated Luminosity



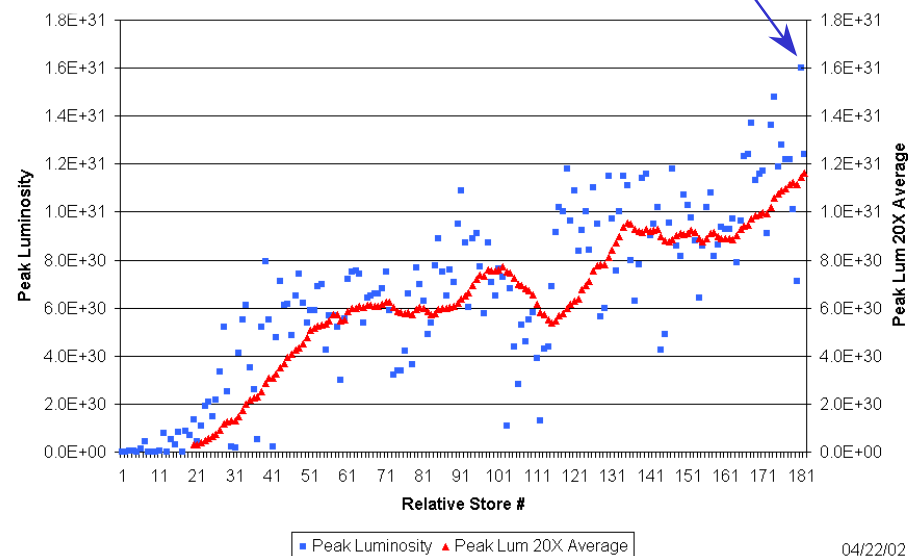
Average weekly delivered  
luminosity ~ 1.5 - 2 pb<sup>-1</sup>

Typically 3-5 shifts of beam  
studies per week

Shot setup time ~ 2-3 hr  
Store duration ~ 12 hr

Best store  $1.6 \times 10^{31} \text{ cm}^{-1} \text{ s}^{-1}$

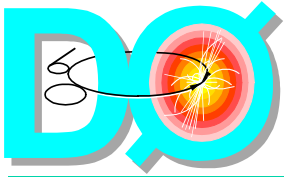
Collider Run IIA Peak Luminosity



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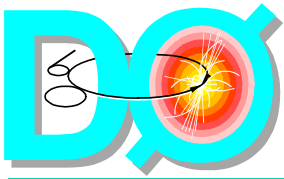
04/22/02  
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# Tevatron Performance /cont.

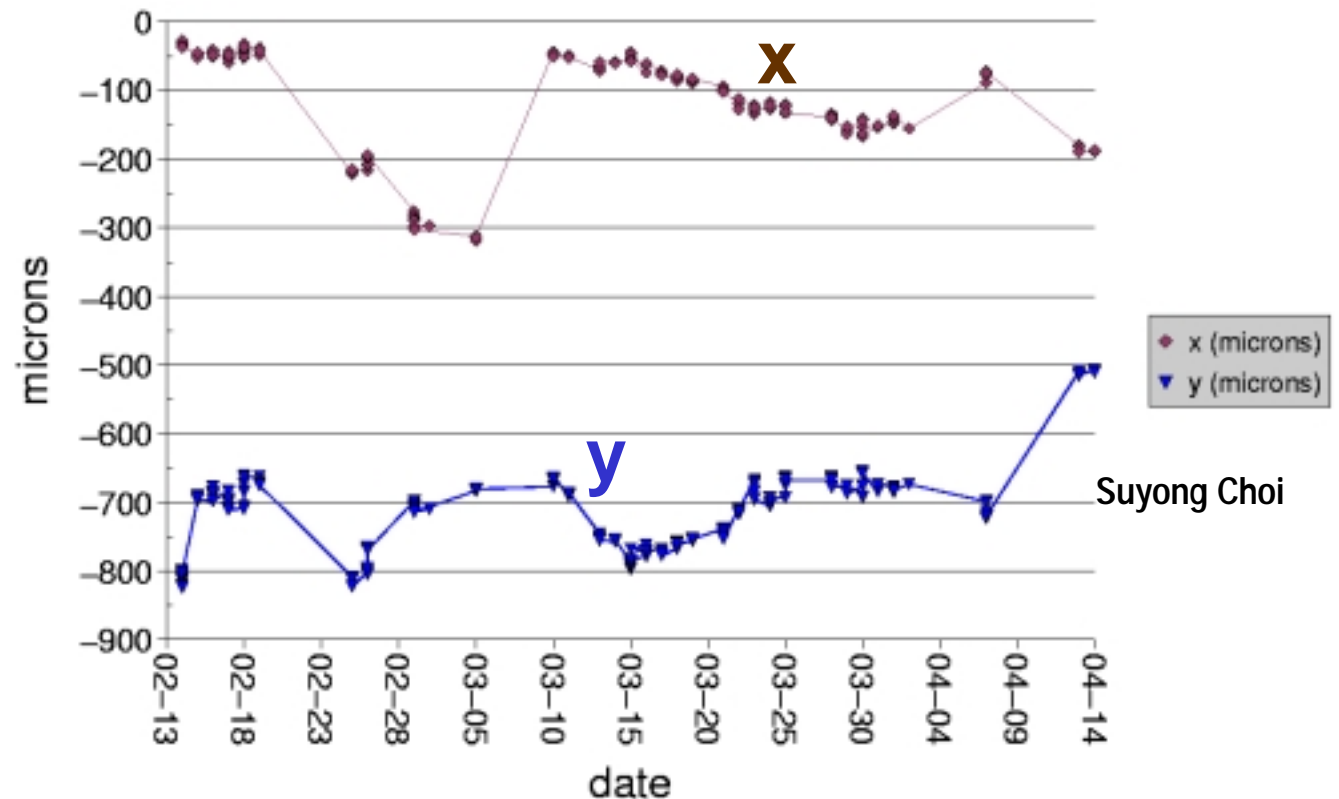
- Proton (antiproton) haloes are about 20-60 kHz (2-4kHz)
- Reduction in losses in BLMs during shot setup (infamous “step 13”) around beginning of April (30 rads  $\rightarrow$  5 rads)
- Settings for integrated and instantaneous dose alarms and abort settings are being reviewed
  - ♦ Did pull radiation abort Feb 1 as peak rate was  $> 12$  rad/s
- Total integrated dose seen by silicon  $\sim 10$  krads (rad. hard to 2 Mrad)
  - ♦ Incident on Mar 30<sup>th</sup> where beam debunched on RF stations tripped and CDF lost 6 SVX ladders, DØ saw only about 0.06 rads in 5 minutes (0.1 mrad/s)
- Instituted interlock TeV abort on RF trip and AA marker
- Shutdowns planned:
  - ♦ 10-14 days sometime after May 15 (decide at PMG May 7) for installation of stochastic cooling tanks for the antiproton ring – hope for immediate improvement in luminosity
  - ♦  $\sim 6$  week shutdown starting Sept 30, driven by schedule for work on the antiproton recycler

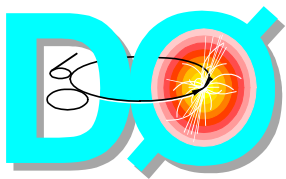




# Beam Position at DØ IP

- Measure Beam Position at  $z \sim 0$
- Vertices with 3 or more SMT tracks attached from p10.15.01 reco.
- Large jumps seem to occur whenever we have sustained periods of shutdown and/or after the accelerator beam studies (few hundred microns)
- Typical max-to-max variation of average beam position in a day is about 10 microns
- There are slow drifts of 30 microns per week in x from early-March to end of March
- Z position stable to within 2 cm over a month with jumps of 5 cm seen (r.m.s. 25-30 cm)





# DØ Performance

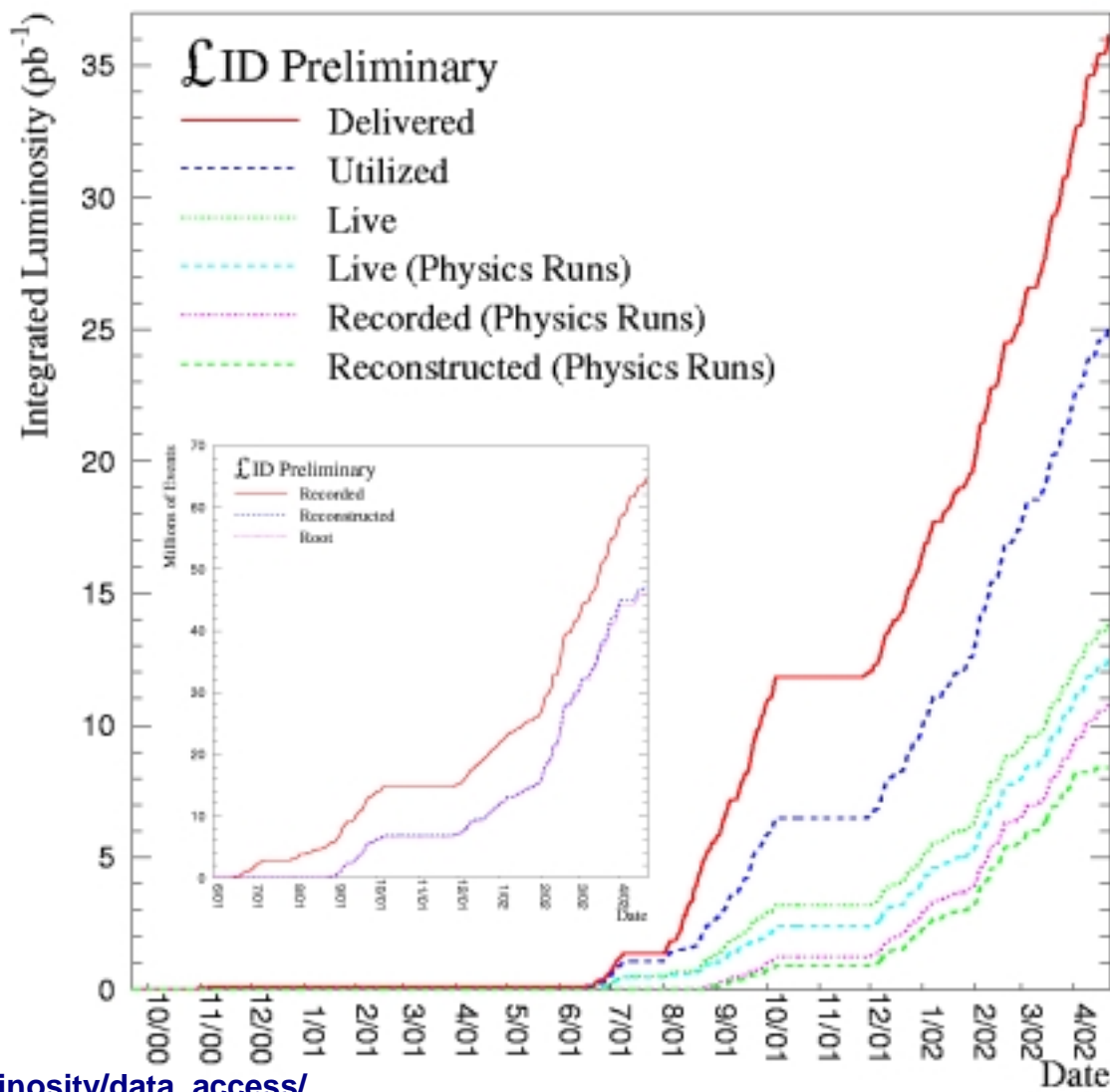
- 36  $\text{pb}^{-1}$  delivered
- 25  $\text{pb}^{-1}$  utilized
- 10.5  $\text{pb}^{-1}$  recorded physics
- 8.4  $\text{pb}^{-1}$  reconstructed
- 65 million recorded
- 45 million root

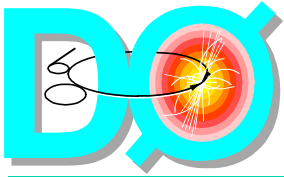
Offline data processing status



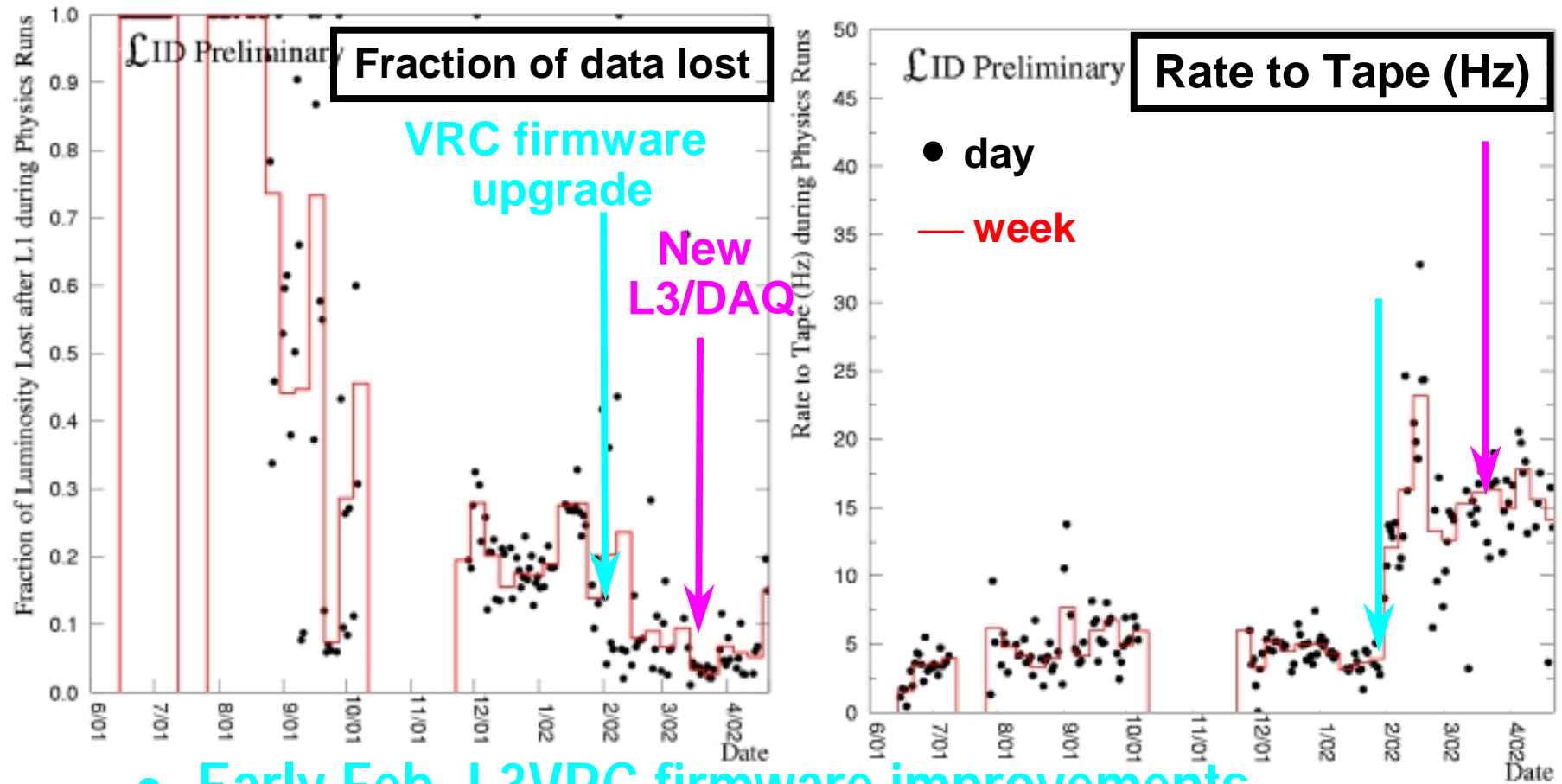
[http://www-d0.fnal.gov/phys\\_id/luminosity/data\\_access/](http://www-d0.fnal.gov/phys_id/luminosity/data_access/)

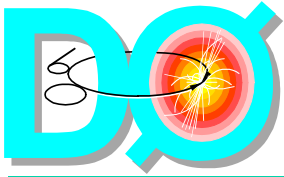
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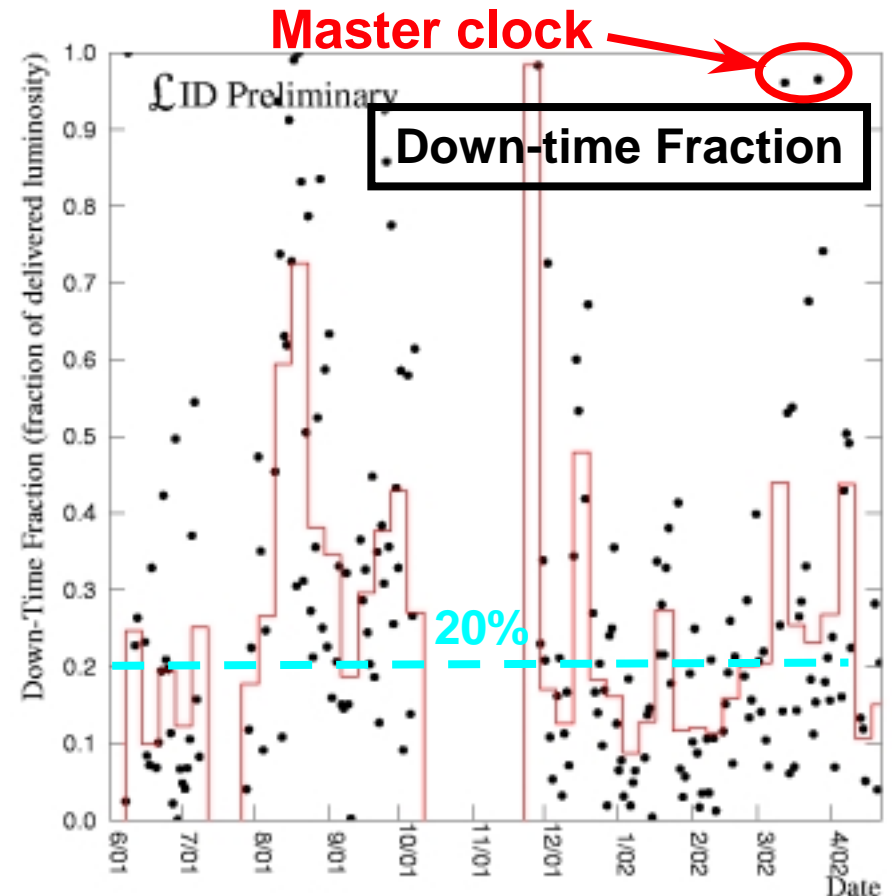
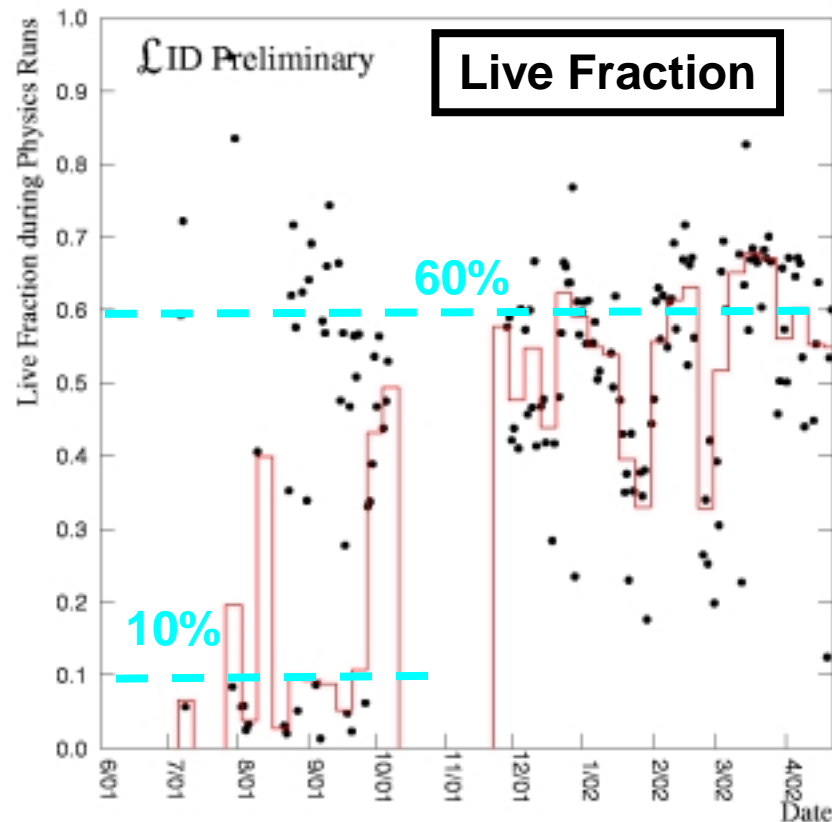


# DAQ Improvements



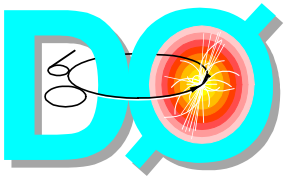


# Data taking efficiency

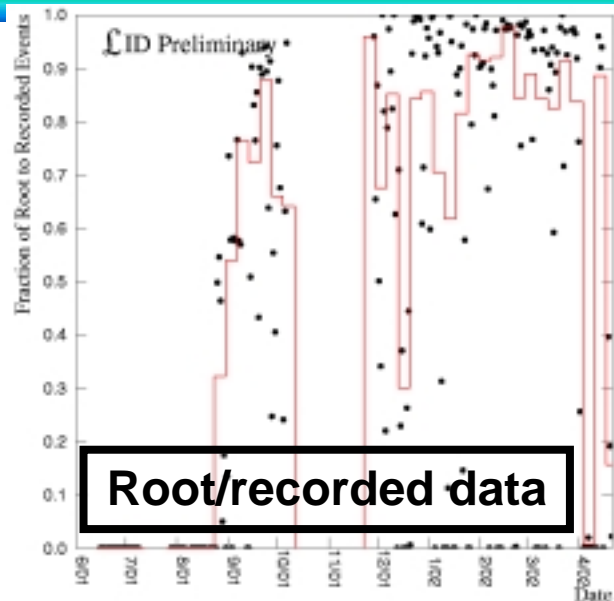


- Live = physics run enabled and no trigger disables
- Down-time = no physics run enabled

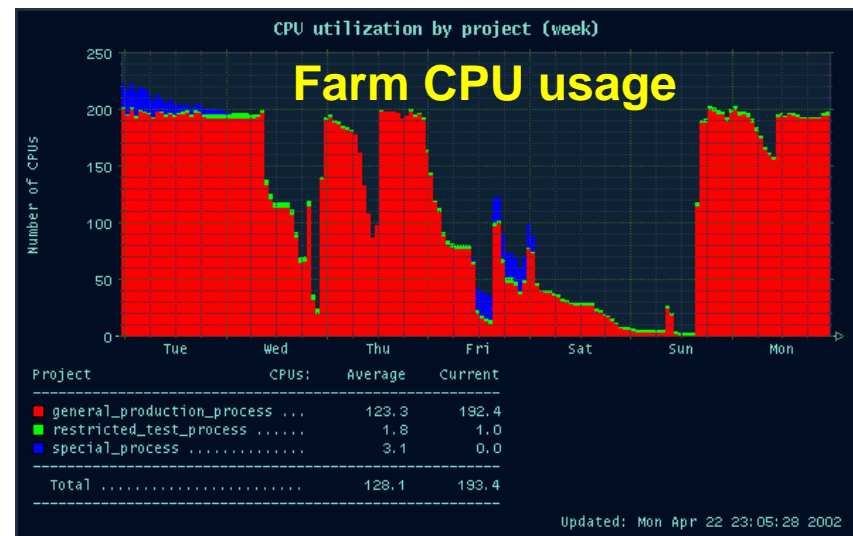
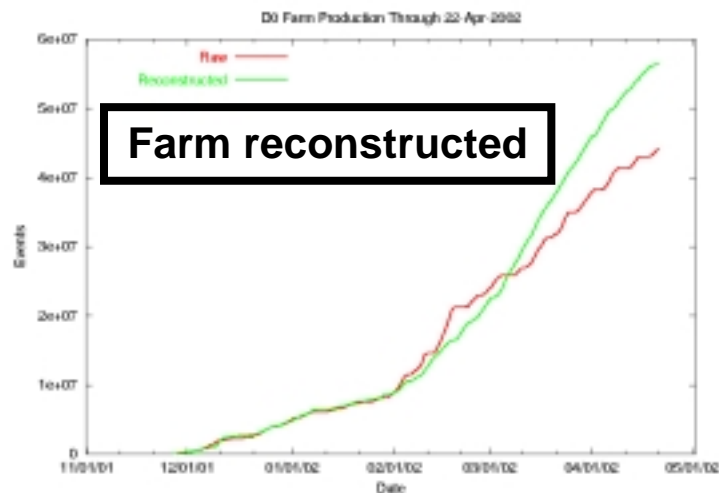




# Offline reconstruction

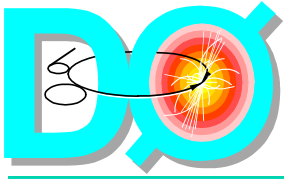


- Offline farms keeping pace with data from the detector
- Reconstruction about 4 million events per day
- Collect  $< 1$  million events/day
- P10.15.01 on the farms



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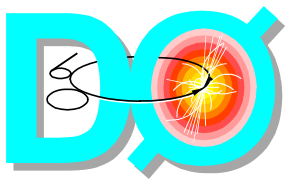




# Notable Operational “Events” at DØ

- SMT IB power supply problems
  - ◆ Access Jan 9-10 for repairs (4 supplies)
  - ◆ Access Feb 21-22 for 2 supplies
- Master clock glitches (mid-March)
  - ◆ Bad Phase Coherent Clock (replaced 3/13) – need to get spares
  - ◆ Continuing annoying events for a few days after
  - ◆ SCL disappearance plays havoc with sequencers, AFEs etc
- SMT water leak March 29
  - ◆ Trips occurred few times a day (whole East side of SMT IB)
  - ◆ Adding cooling water at 1 gal/day
  - ◆ Investigation of cooling line on April 4 confirmed leak
  - ◆ SMT-East off April 4-11
  - ◆ Opened cathedral for repairs (disconnect water) April 11
  - ◆ Open (close) in 4 (3) hours
- L3 DAQ replacement in March
- L2 Trigger components coming online

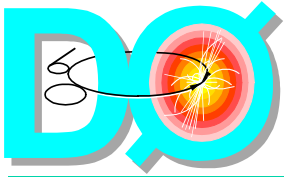




# Improvements in the Control Room

- Luminosity reporting per run/day/week – see Lum ID page
- Working on tools for general downtime log
- Modifications in the control room
  - ◆ Swapped FPD and CFT consoles
  - ◆ Consolidation of safety consoles – more room for SMT
  - ◆ Add L2 console
  - ◆ New carpet, chairs, whiteboards, photographs, trigger quilt
- Volunteers working on an improved Captain's guide ← you can help!
- Regular accesses to the collision hall - Make sure your training is up to date
- Checklists to help improve efficiency and communication – store, runs checklist
- Ultimate goal to increase efficiency during good luminosity and to improve communication between various shifters

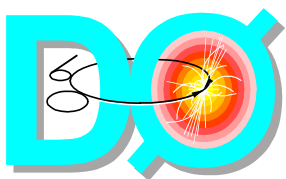




# DØ Shifts

- DØ Shifts
  - ◆ Shift Captain (Etta Johnson)
    - ▲ Pool of about 35 captains (6 shifts/2months)
  - ◆ DAQ Shifter (Alan Stone, Bill Lee, Drew Alton)
    - ▲ 35 DAQ shifters/year, 2-3 shifts overlap for training
  - ◆ Operations shifter (Russ Rucinski)
  - ◆ Detector: CAL, CFT, FPD, MUO, SMT
  - ◆ Software shifts e.g. SAM, Reco
  - ◆ On-call people for each subsystem
- 3 shifts/day x 365 days = 1095 shifts per position
- Consolidation of shifts down the road....
- Average about 15 shifts/person for 366 people who did shifts in last year (statistics courtesy of Alan Stone→IB meeting)
- Don't be shy about signing up!!!





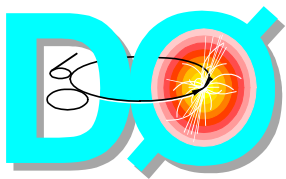
**Captain Shift Calendar**

year view month view **May 2002** week view day view  
CAP preferences

Sun	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 00:00 Stefan Soldner-Rembold 08:00 Linda Stutte 16:00 Tom Marshall	2 00:00 Scott Snyder 08:00 Stefan Soldner-Rembold 16:00 David Buchholz	3 00:00 Alice Bean 08:00 Greg Landsberg 16:00 Horst Wahl	4 00:00 Alice Bean 08:00 Horst Wahl 16:00 Alan Stone
5 00:00 Alice Bean 08:00 Horst Wahl 16:00 Alan Stone	6 00:00 Gene Fisk 08:00 Jim Linnemann 16:00 Alan Bross	7 00:00 Gene Fisk 08:00 Jim Linnemann 16:00 Ron Madaras	8 00:00 Tom Marshall 08:00 Jim Linnemann 16:00 Ron Madaras	9 00:00 Mike Tuts 08:00 Linda Stutte 16:00 Ron Madaras	10 00:00 Mike Tuts 08:00 Greg Landsberg 16:00 Jae Yu
11 00:00 Stu Fuess 08:00 Jae Yu 16:00 Darien Woods	12 00:00 Stu Fuess 16:00 Darien Woods	13 00:00 Scott Synder 08:00 Tom Marshall 16:00 Darien Woods	14 00:00 Ken Johns 08:00 Boaz Klima 16:00 Stefan Soldner-Rembold	15 00:00 Ken Johns 08:00 Boaz Klima 16:00 Christophe Royon	16 00:00 Boaz Klima 16:00 Christophe Royon
17 00:00 Horst Wahl 08:00 Greg Landsberg 16:00 Christophe Royon	18 00:00 Horst Wahl 08:00 David Buchholz 16:00 Linda Stutte	19 00:00 David Buchholz 16:00 Gene Fisk	20 00:00 Herbert Greenlee 16:00 Harry Weerts	21 00:00 Maris Abolins 16:00 Harry Weerts	22 00:00 Maris Abolins 16:00 Harry Weerts
23 00:00 Maris Abolins 16:00 Terry Wyatt	24 00:00 Maris Abolins 16:00 Terry Wyatt	25 00:00 Maris Abolins 16:00 Terry Wyatt	26 00:00 Alan Bross	27 00:00 Alan Bross 16:00 John Krane	28 00:00 Herbert Greenlee 16:00 John Krane
29 00:00 Mike Tuts 08:00 Herbert Greenlee 16:00 John Krane	30 00:00 Ursula Bassler 08:00 Dave Cutts 16:00 John Krane	31 00:00 Ursula Bassler 08:00 Dave Cutts 16:00 Ken Johns			

You here!





# Online Data Monitoring

- Work on better tools for monitoring data and triggers
- Examines group developing better tools and methods to select data and display it

(Pushpa Bhat, Andrei Mayorov, Joel Snow + others)

e.g. select run/trigger on the fly, end-run summaries

Physics examine (Michiel Sanders)

- Runs configurations to be stored in name-value server and in Runs Summary database

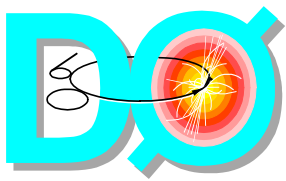
e.g. Luminosity trigger rate GUI



Jaewon Park

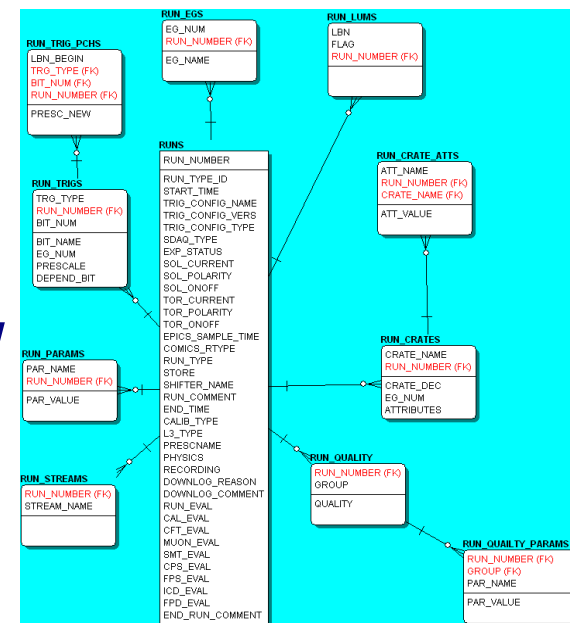


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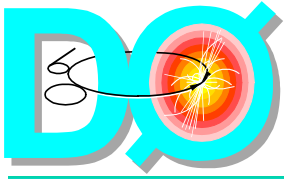
# Offline Data Quality

- Provide simple access to offline run quality information for analyses
- Store quality information by group
  - ♦ detector, ID object, physics, trigger
- Incorporated as sub-tables of Run Summary Database (J. Simmons / V. Sirotenko)
- At least one status word per group with common structure for general use provided to reco, root, thumbnail
- Current definitions:
  - good, reasonable, bad, special, unknown
- Groups are responsible for updating relevant information
  - ♦ web, GUI, reco, scripts, examines



Stefan Söldner-Rembold

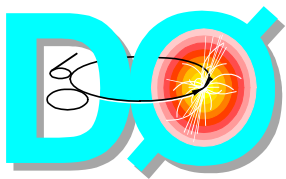




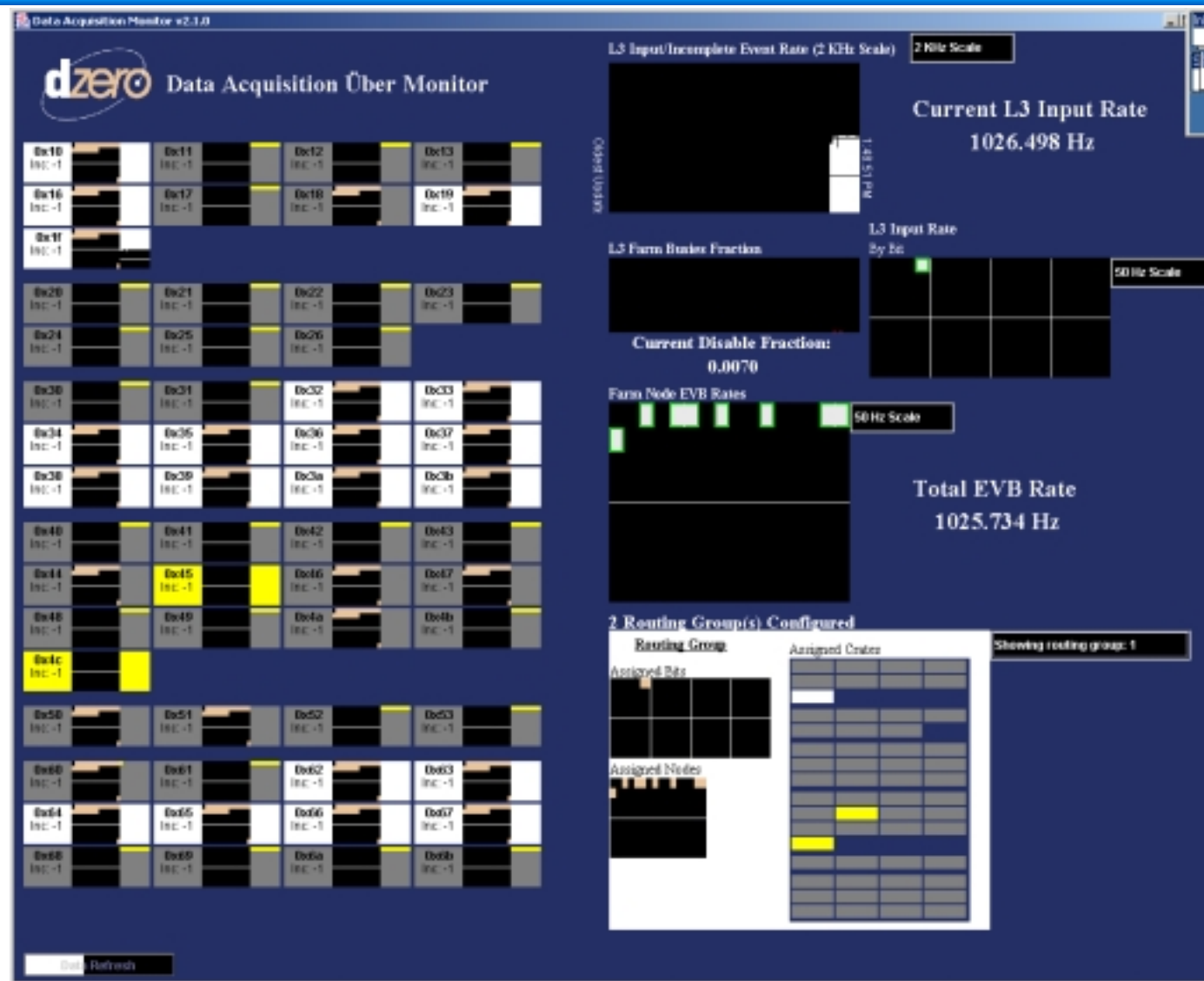
# Replaced L3/DAQ System

- L3 “Commodity” DAQ
    - ♦ Replace all VME Buffer Driver boards (VBD) by SBCs and send data over fast ethernet switches
  - SBC (Single Board Computer)
    - ♦ Intel 1GHz, VME based, dual 100Mb ethernet, Linux OS
  - Routing of data blocks performed by specialized SBC that talks to the Trigger Framework – the Routing Master (RM)
  - Event building and trigger decisions performed by Linux farm nodes
    - ♦ Old system used NT DAQ nodes for event building with Linux farms for filtering
- ✓ **Software transition Mar 26, fairly painless...**

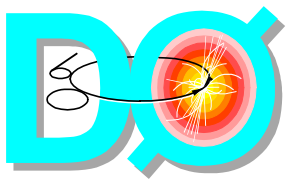




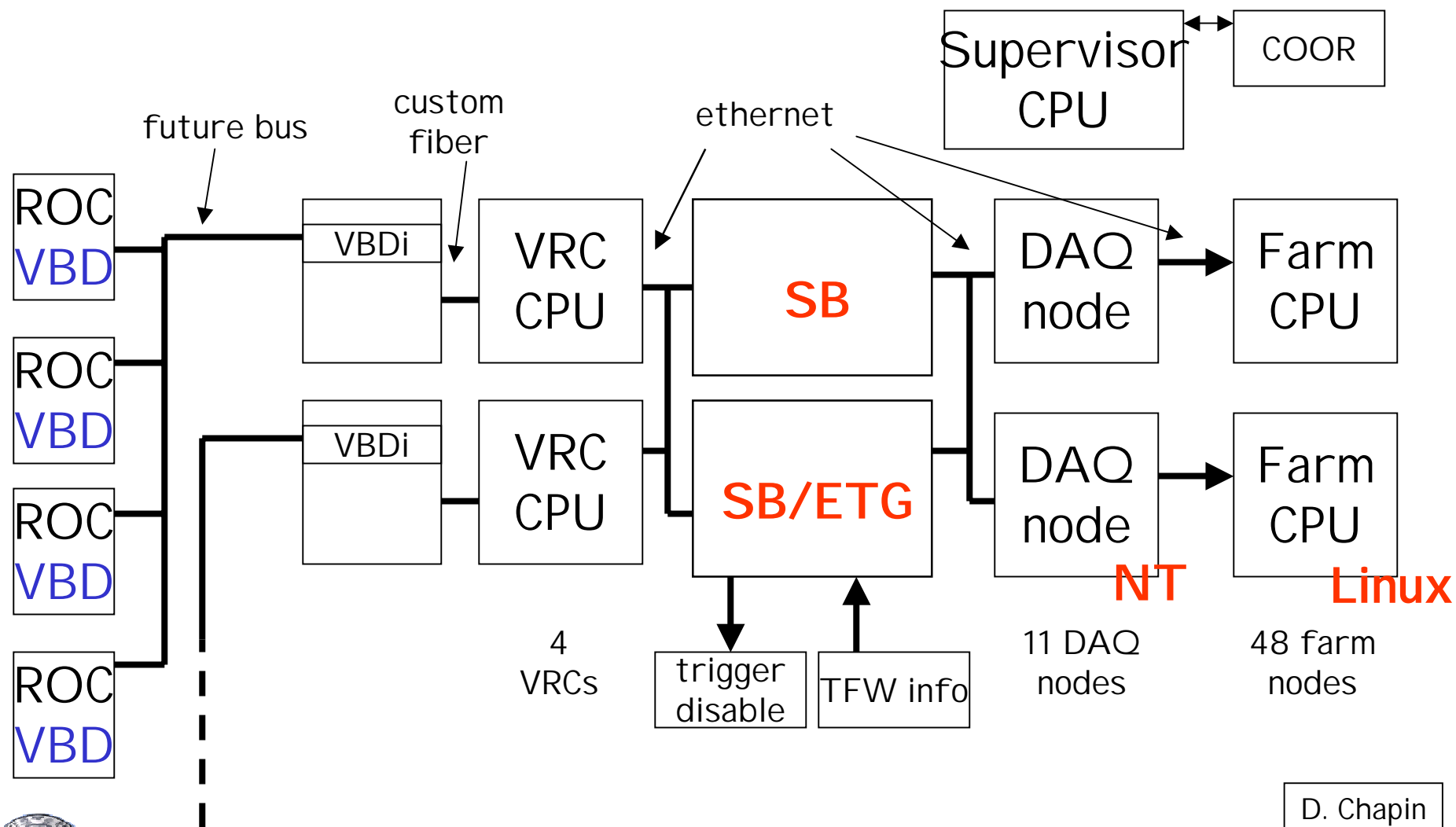
# L3 Über Monitor



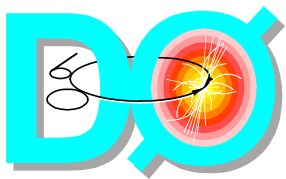




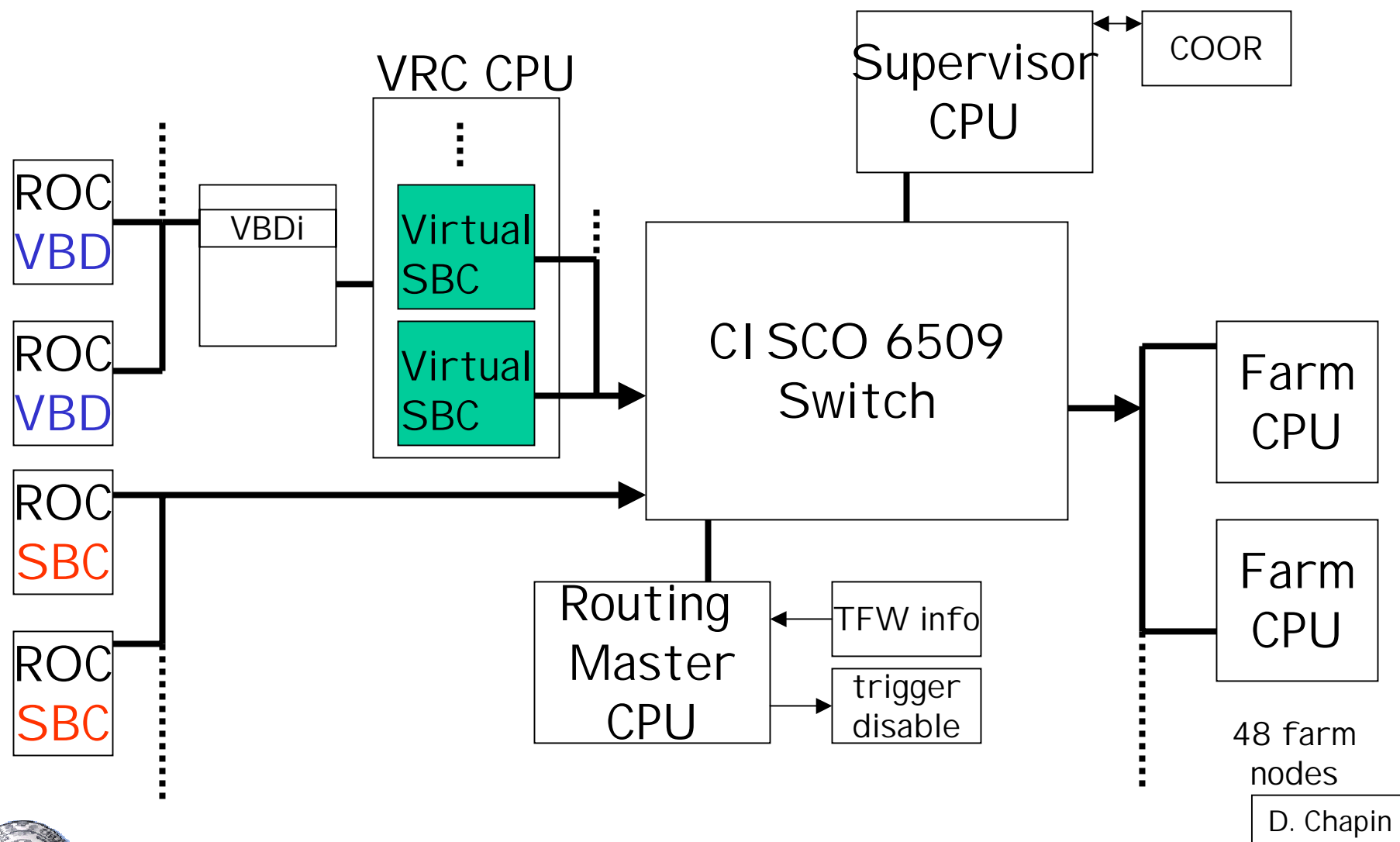
# L3 Past...

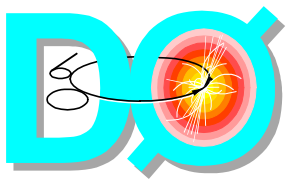


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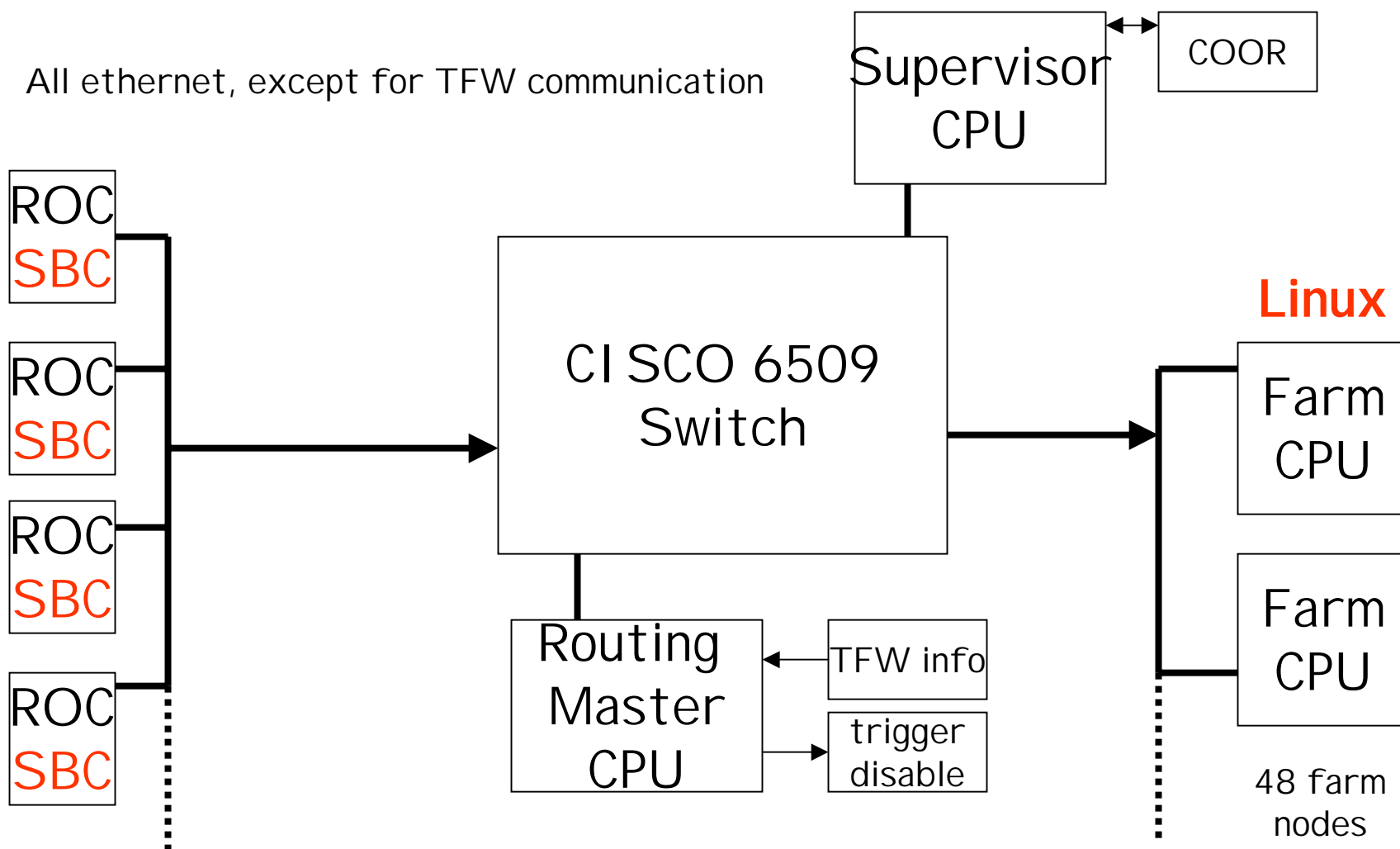


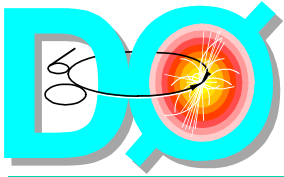
# L3 Present...





# L3 Future...

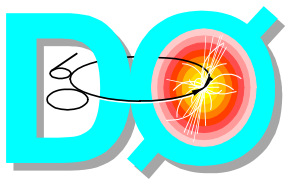




# L3/cDAQ continued

- All essential components have been ordered
  - ◆ All switches delivered and installed
  - ◆ 58/72 SBC's delivered
  - ◆ 17/77 Digital I/O boards delivered
- Expect to start installing remainder of SBCs in 2 weeks
  - ◆ need DIO, extender boards and "Xmas-light" front panels
  - ◆ 6 installed now for testing and real operations
  - ◆ Transparent to the user...
- Fine tuning and improvements in monitoring and operations
  - ◆ Relatively stable operations for nearly a month
- Wait to purchase more farm nodes (dual P4) + Cisco switch blades if necessary
- Work on L3 Trigger Crate for RM to have 128 disable lines to the TFW continuing (have 32 now)

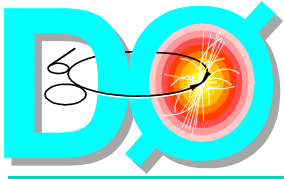




# L3 cDAQ Expected Rates

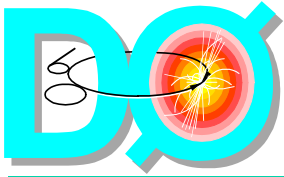
- Individual readout crates are almost all capable of  $> 1$  kHz
- Front-end Glitches
  - ◆ known Muon MFC issues
    - ▲ 2 preproduction MFCs work fine; remainder in  $\sim 1$  month
  - ◆ VRBC multibuffer mode buffer corruption
    - ▲ Firmware issue; being actively pursued
  - ◆ Multibuffer mode for all other crates works (with some debugging)
- With multiple crate readout, limited by ethernet (data volume) for VRC
  - ◆ MUO (1kHz), CAL (500Hz), SMT (200-300Hz)
  - ◆ MCHI software VRC (100 Hz)
- With resolution of VRBC issue + start of SBC installation expect few hundred Hz in a few weeks (500 Hz?)





**Tremendous thanks to the  
L3 team for their hard work  
and dedication which has  
led to the smooth transition**





# Global Trigger Lists

- Trigger Board meets once a week
  - ◆ Starting to raise the threshold on certification of triggers
- Not too many handles to tweak the last few months...
  - ◆ Are running L1 muon, L1 CAL and L3 filters on jet, EM, tau objects.
  - ◆ L3 Muons are imminent. L2 muon tested and almost ready to go in.
- global\_CalMuon triggers
  - ◆ Version 1.4-1.5 Before October shutdown
  - ◆ Version 2.0-2.1 28 November – 18 December
  - ◆ Version 3.00-3.30 18 December through January (Moriond dataset)
    - ▲ L1 Cal (jet,e) and muon ( $\mu$ ,  $\mu\mu$ ), (+  $\tau$ ) triggers with L3 filters in Mark-and-Pass mode
  - ◆ Version 4.00-4.30 February through March (40 Hz in to L3)
    - ▲ Start filtering at L3 (with ~10% M&P), additional (J/psi) and tweaking of L1 trigger thresholds
  - ◆ Version 5.00-5.01 running since March 21
    - ▲ Removed “safety net”, new QCD jet triggers, L3 EM shower shape
  - ◆ Version 6.00 waiting in the wings...
    - ▲ L3 muon filters

- Special trigger requests as they come up

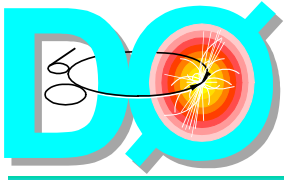


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DØ Detector and Operations Status

DØ Collaboration Meeting  
April 24, 2002



# Online Systems

- **Hardware**

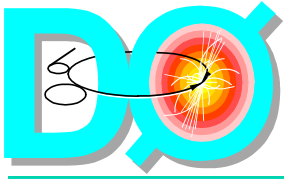
- ◆ **Additional nodes for the Control Room**
  - ▲ Graphics (event display), 4-head (spare for DAQ), DØ/Accelerator gateway, L2 monitoring, SMT web display/monitor
- ◆ **Recycle some of the L3 NT nodes**
- ◆ **Double memory in most nodes**
- ◆ **Work on GB-capable Collector and Distributor nodes (Linux driver problems...)**
- ◆ **Improving DAQ infrastructure to handle anticipated rates (L3 network and MCH)**

- **Control system hardware:**

- ◆ **collecting bits and pieces of 1553 controllers, RMIs, rack monitors**
- ◆ **debating Run2b future of 1553 components: scavenge or rebuild?**
- ◆ **"using up" spare PowerPC processors - few more to be purchased**



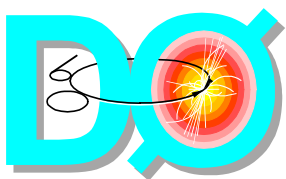




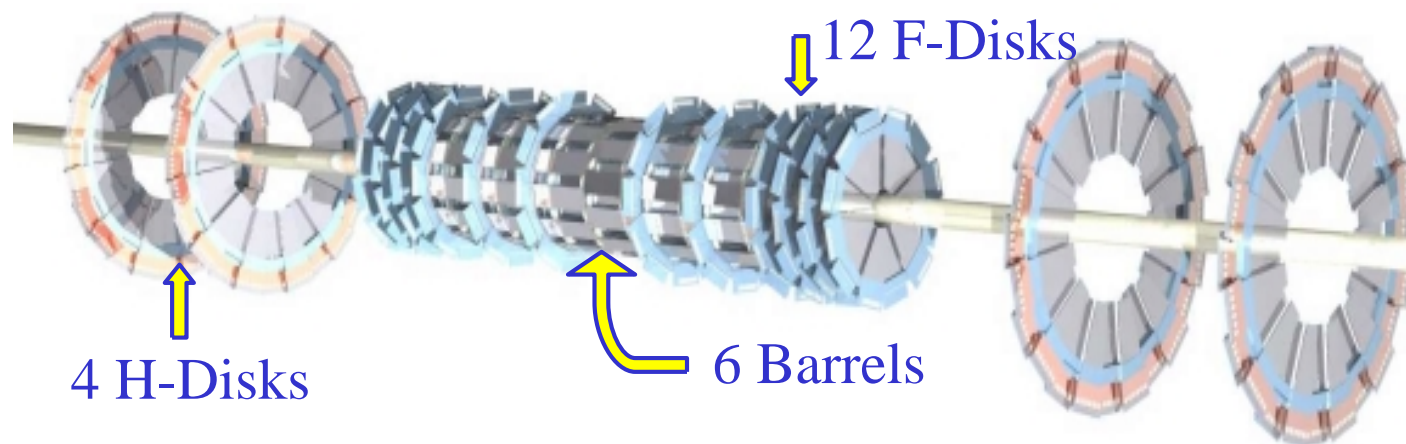
# Controls

- COMICS (download process)
  - ◆ New release pending
    - ▲ More robust code
    - ▲ Error recovery with retries
    - ▲ Transaction log
    - ▲ Extensible load actions
  - ◆ Verify mode completed and tested
  - ◆ Expert GUI under development
- Name Server
  - ◆ Based on EPICS process variables
  - ◆ Server host installed
  - ◆ Automatic context save and restore installed
- Access Control added to IOC's
  - ◆ Master clock
  - ◆ Calorimeter and muon HV system
- Hardware Database
  - ◆ Contains 100K records (process variables)
- SES (Alarm System)
  - ◆ Now in use by most detector groups
  - ◆ Alarm watcher released
    - ▲ Verbal notification (the voice!) of conditions serious enough to warrant at least pausing a run
    - ▲ Auto-Pause mode tested but not in use yet
    - ▲ Database templates being modified to activate watcher
    - ▲ HV trips sending alarms already
    - ▲ Adding LVPS trips
  - ◆ Database templates modified
    - ▲ HV templates generate alarms
    - ▲ Most Calorimeter and Muon templates generate alarms





# Silicon Microstrip Tracker



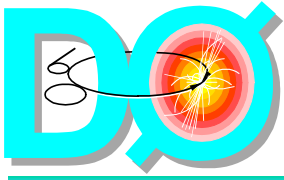
- ◆ Barrel Detectors measure central tracks
- ◆ Disk Detectors for forward tracking
- ◆ 6 Barrel (each 12cm long)  $|z| < 38.4$  cm  $2.7$  cm  $< R < 9.5$  cm
- ◆ 12 F-Disks  $|z| < 54.8$  cm  $2.6$  cm  $< R < 10.5$  cm
- ◆ 4 H-Disks  $|z| < 120$  cm  $9.5$  cm  $< R < 26$  cm
- ◆ 793 000 readout channels

## Percentage of working devices:

Barrel: ~95%, F-disks: ~95%, H-disks: ~87%

**Total: 93%**





# SMT Status

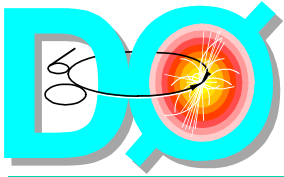
- **Operations**

- ◆ Inserting bleeding resistors in parallel with HV pods to reduce ramp down time (15 min → 3 min)
- ◆ Disconnected water flow to SE1 IB crate on April 11 due to water leak from water-cooled heat exchanger
  - ▲ Crate only dissipates 450W; runs about 10°C warmer than other crates (air cooled)
- ◆ Install grounding straps on IB crates during longer shutdown
- ◆ Run calibrations runs about once a week

- **Analyses**

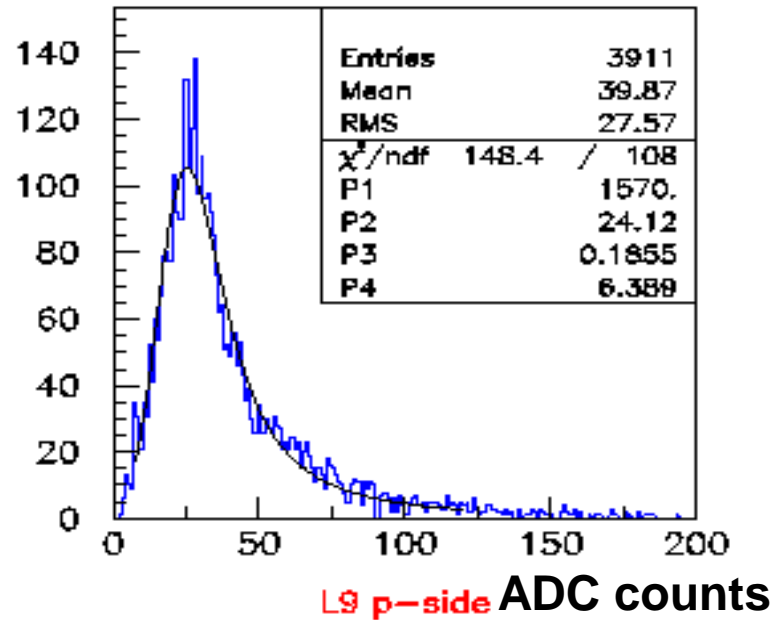
- ◆ Investigating source of noise problems ("grassy noise") in Micron F-wedge
- ◆ Working on geometry and alignment





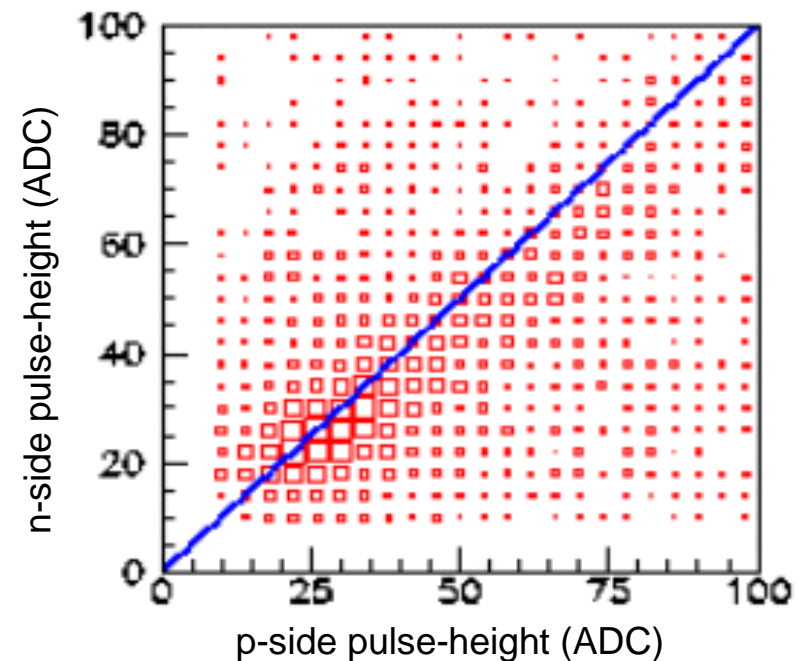
# SMT Clusters

1 mip = 4 fC = 25 ADC counts



$S/N > 10$   
as expected!

pulse-height correlation  
between p- and n-side



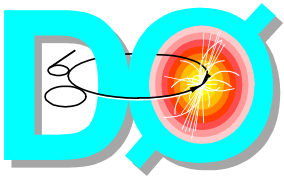
♦ hit efficiency studies underway, look promising



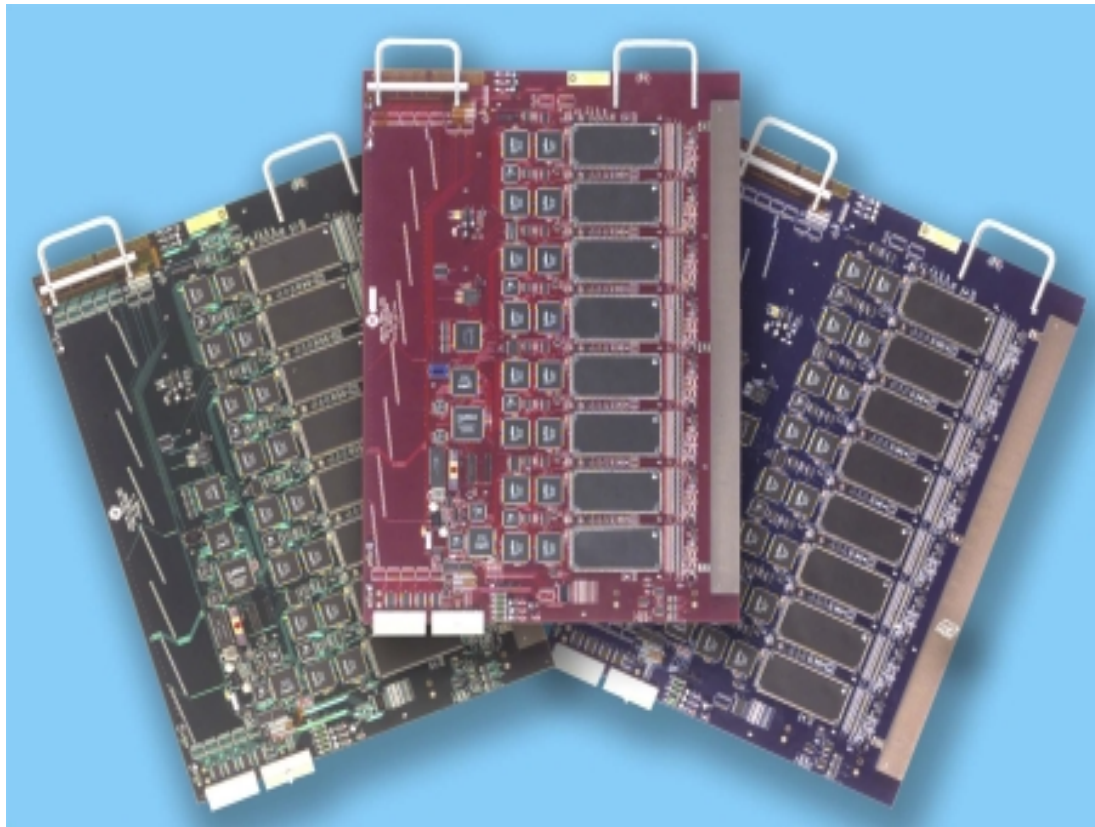
Leslie Groer  
Columbia University

28  
DØ Detector and Operations Status

DØ Collaboration Meeting  
April 24, 2002



# CFT/CPS/FPS/FPD AFE

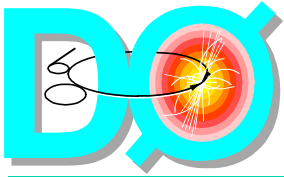


AFE boards come in three classes (differing in input gain and VLPC bias control)

- ◆ CFT only ("green" boards)  
136 needed (76 for axial/trigger).
- ◆ Combined CPS/CFT ("blue" boards) 30 needed  
(all are used in the trigger)
- ◆ FPS (red boards)  
32 needed  
(all are used in the trigger)

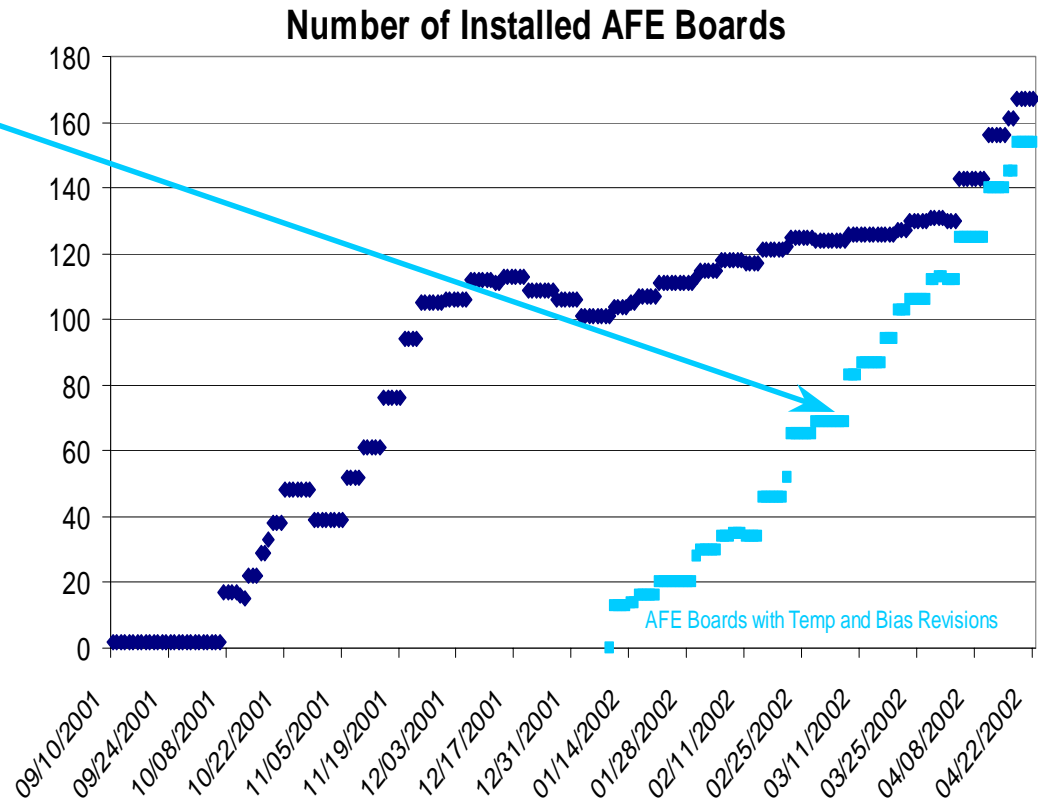
- 2 AFEs per VLPC cassette
- 512 channels, 8 MCM (1 SVX, 4 SIFT chips)
- Provide digital trigger information, pulse height and control temp & bias



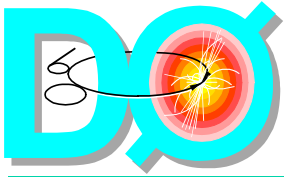


# CFT+PS Status

- 167 Analog Front End (AFE) boards currently installed on the platform
- ✓ The Central Fiber Tracker and Preshower are fully instrumented as of last week
- The infrastructure for Forward Preshower Detector (FPS) readout is being exercised
- ✓ 92% of installed AFE boards currently have revised temperature and bias control
- Remaining installed AFE boards do not usually latch under current operating conditions
- Expect to complete instrumentation of Forward Preshower Detector within six weeks

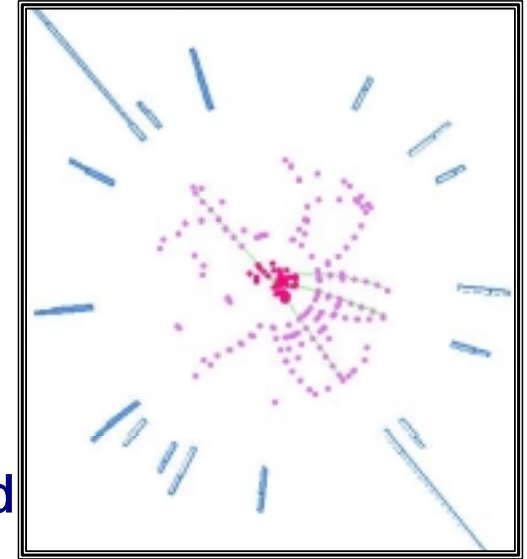


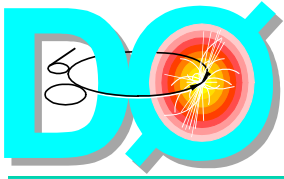




# CFT+PS Status / cont

- CFT+PS readout is generally well behaved
- Detectors appear to be performing well
- Tracks are routinely being reconstructed, and results are being incorporated into higher level analyses
- But there is still plenty of work to get system fully operational, corner undesirable features of the system, and to optimize performance of the CFT+PS readout system (e.g. split pedestals, coupling of threshold and pedestal values etc)
- Substantial progress developing, testing, and integrating components of the L1 Central Track Trigger
  - ◆ integration tests are in progress at the Combined Test Stand
  - ◆ virtually all hardware is installed and cabled up
  - ◆ relative timing of control signals at Mixer Box has been verified on the platform for one (of five) trigger supersectors
  - ◆ highest priority assigned to providing tracks to L1 Muon (expected before June 1)

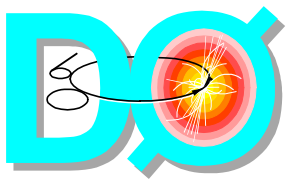




**Tremendous thanks are due  
also to the AFE team  
for their hard work, long  
hours and dedication**

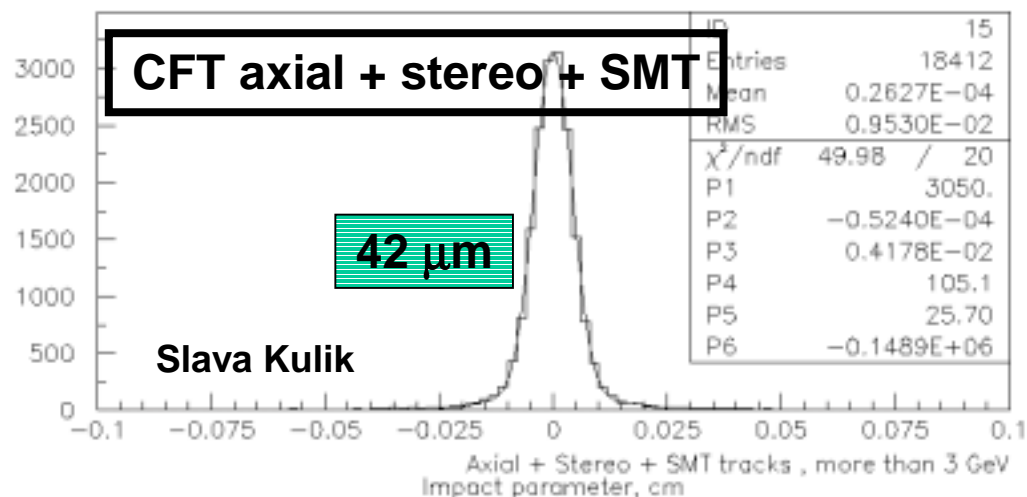
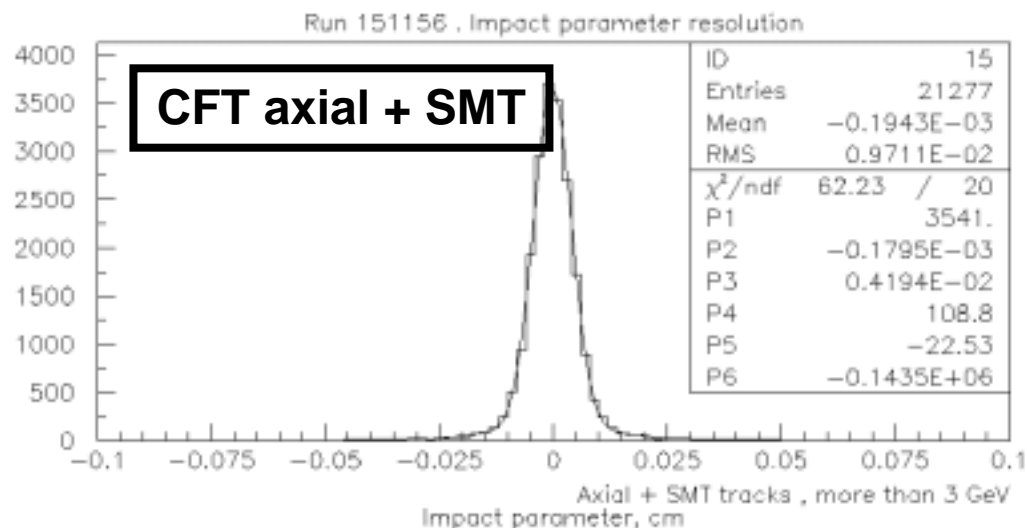


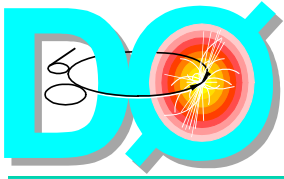




# DCA from Global Tracks

- Impact parameter resolution about 42 microns for global tracks with  $p_t > 3$  GeV
- Beam spot size is about 28 microns

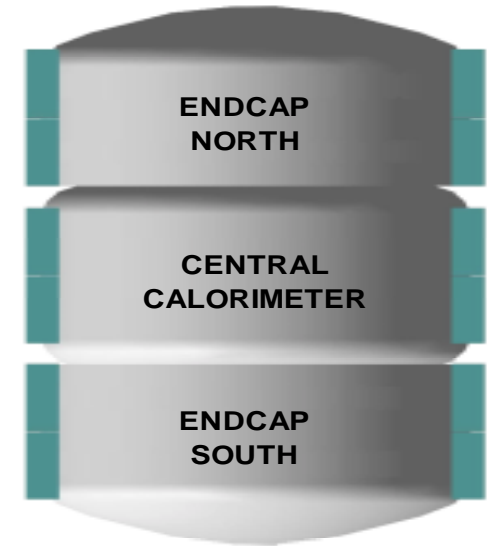




# Calorimeter/ICD

- **Calorimeter**

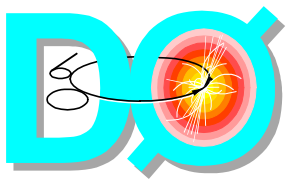
- ◆ Very stable running – occasional power supply or board replacement needed
- ◆ ~50 bad channels (0.1%)
- ◆ Trigger readout to  $|\eta| < 0.8$ , 1.6 imminent, then 2.4
- ◆ Preliminary measurements of coherent noise  $< 0.5$  ADC counts ( $< 2$  MeV)
- ◆ Removal of slower SCA chips + timing code corrected
- ◆ Studying calibration with pulsers and non-linearity effects



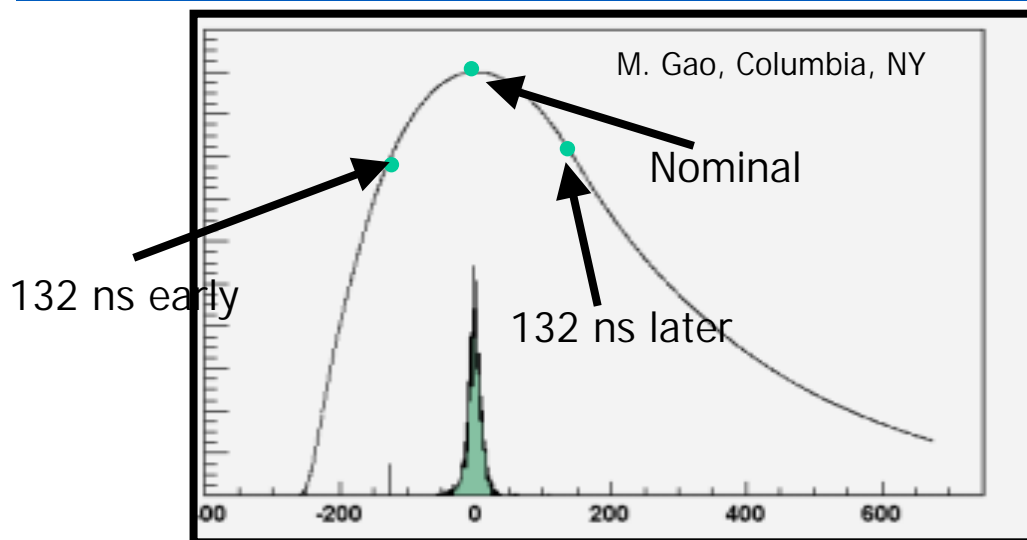
- **ICD**

- ◆ HV stable
- ◆ Spare PMTs in stock – need characterization and then replace weaker tubes
- ◆ Understanding channel mapping and fine-tune energy scale and calorimeter weights
- ◆ Improve MC geometry and material representation
- ◆ LED calibrations





# Timing Studies and Improvements



➤ Modified relative timing between quadrants in Timing and Control FPGA code

Sampling time vs amount sampled

ADC count / peak value

when sample at (relative to peak):

- -50 ns 98.01%
- -30 ns 99.29%
- -20 ns 99.69%
- -10 ns 99.92%
- 10 ns 99.93%
- 20 ns 99.71%
- 30 ns 99.34%
- 50 ns 98.23%

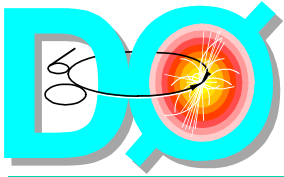
Crates (except for ECSNW) have

*Mean: within +/- 10 ns*

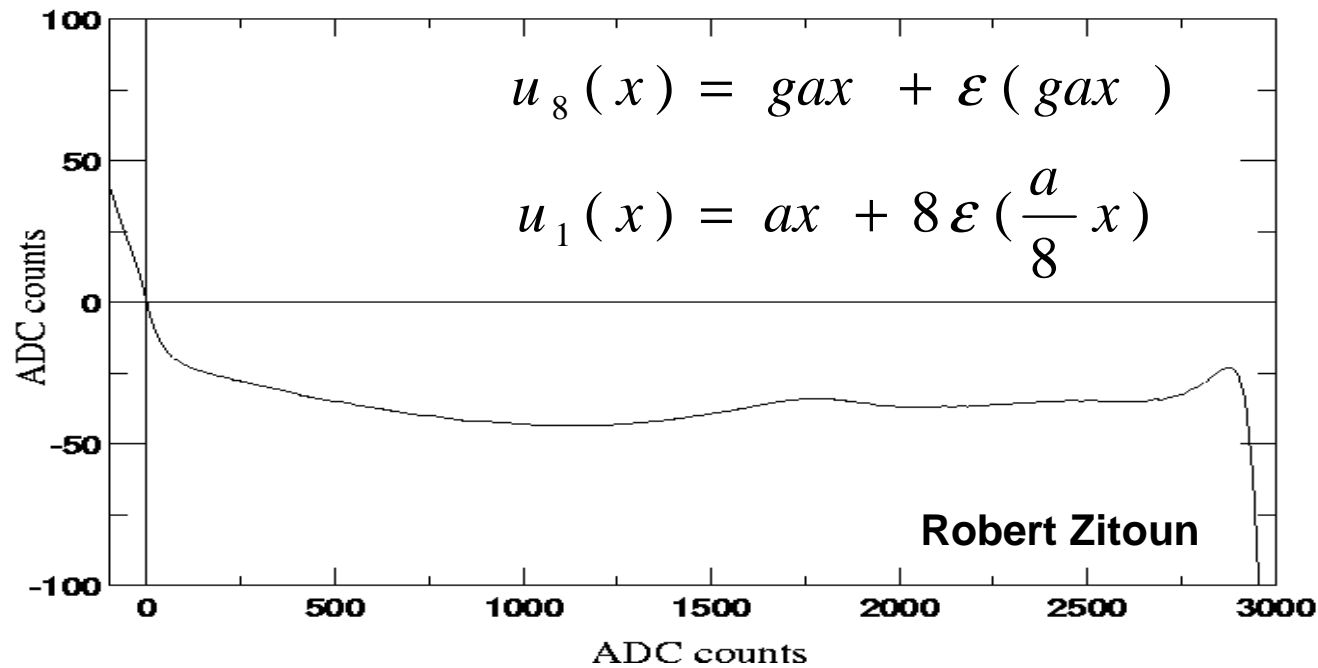
*For Crate 4 sampling time is 25ns away*



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Columbia University



# Non-Linearity studies

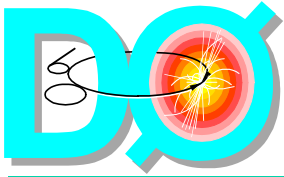


Non-linearity has significant effect in low energy region (jet resolutions etc)

But can be parametrized. Package available (cal\_nlp) and next release P11.06 will have it.

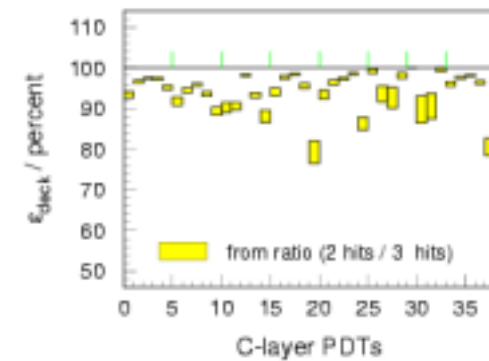
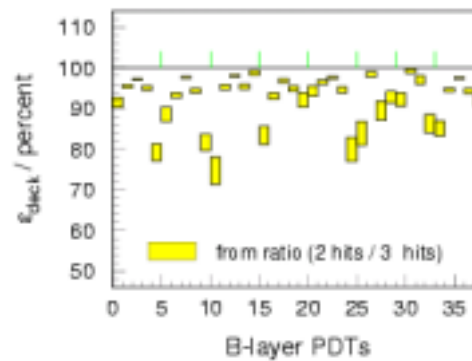
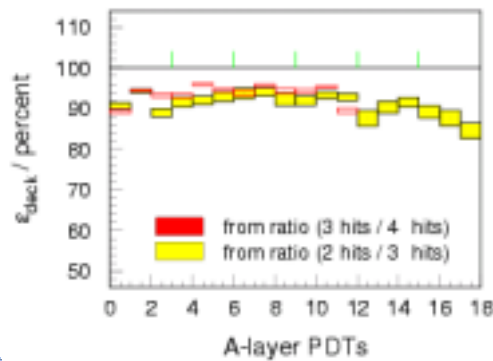
Hardware fix is non-trivial, but studies underway with modified BLS boards



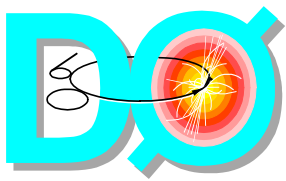


# Muon

- Muon Fanout cards to be replaced as well as 68k processor boards with PPCs (~ 1 month)
- Preproduction MFCs clearly working better
- L2 and L3 triggers imminent
- **Central Muon PDT** - mostly stable running
  - ◆ Occasional (<2%) synchronization problem in 2 front-end crates – being worked on (gain 5-8% of dead-time)
  - ◆ All channels calibrated and  $t_0$  values loaded
  - ◆ Efficiency studies underway (hits and segments)



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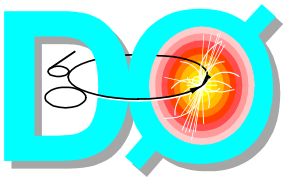


# Central Muon Scintillator

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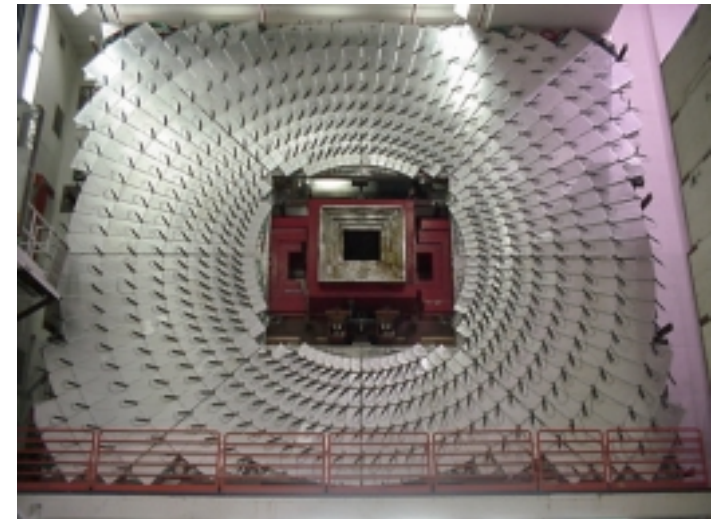
- 360 cosmic-cap, 630 A- $\phi$  counters
- No major problems
- All B and C layer alive, 1 dead A layer
- 93% B and C layer calibrated with adjusted thresholds to compensate for gain variations
- Looking at LED data for A-layer gains to combine with cosmic data



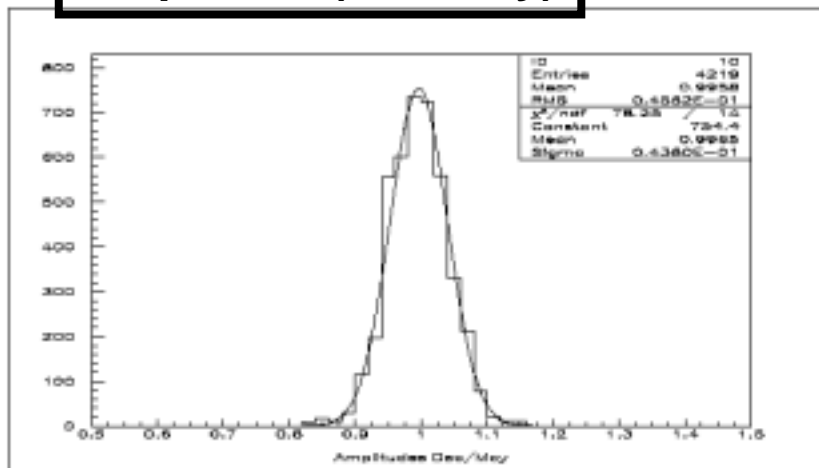


# Forward Muon Trigger System (Pixel)

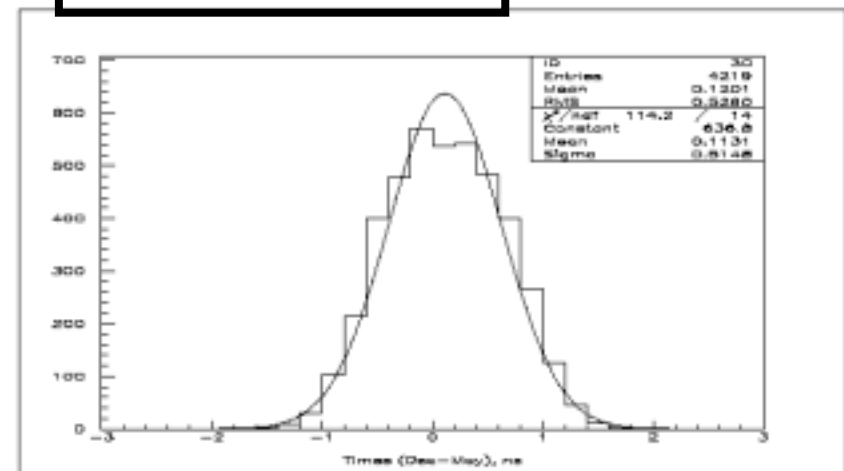
- Stable operation
  - ◆ Less than 0.2% dead channels
  - ◆ Long term stability of amplitude (~5%) and timing (better than 1ns)
  - ◆ MIP detection efficiency is >99%
  - ◆ no radiation aging up to well above  $15\text{fb}^{-1}$

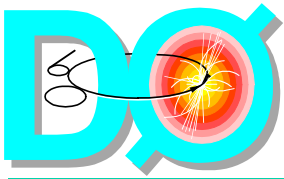


**Amplitude (Dec-May)**



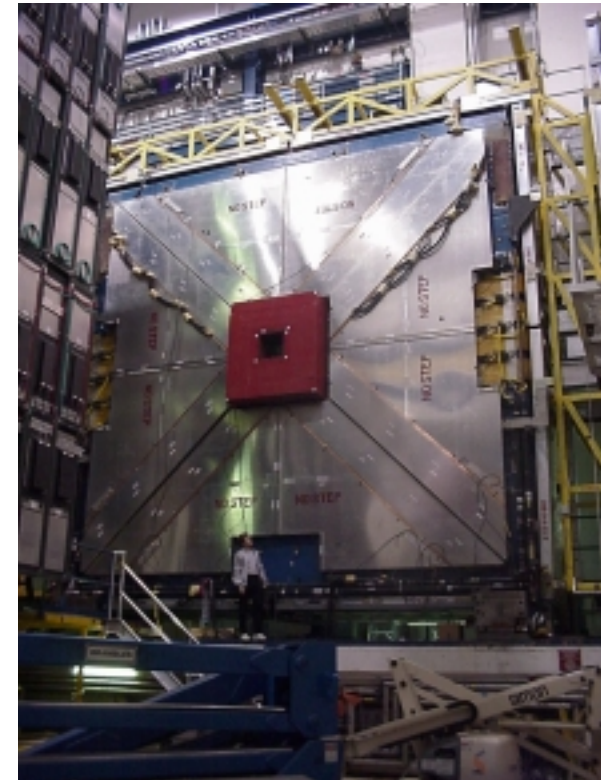
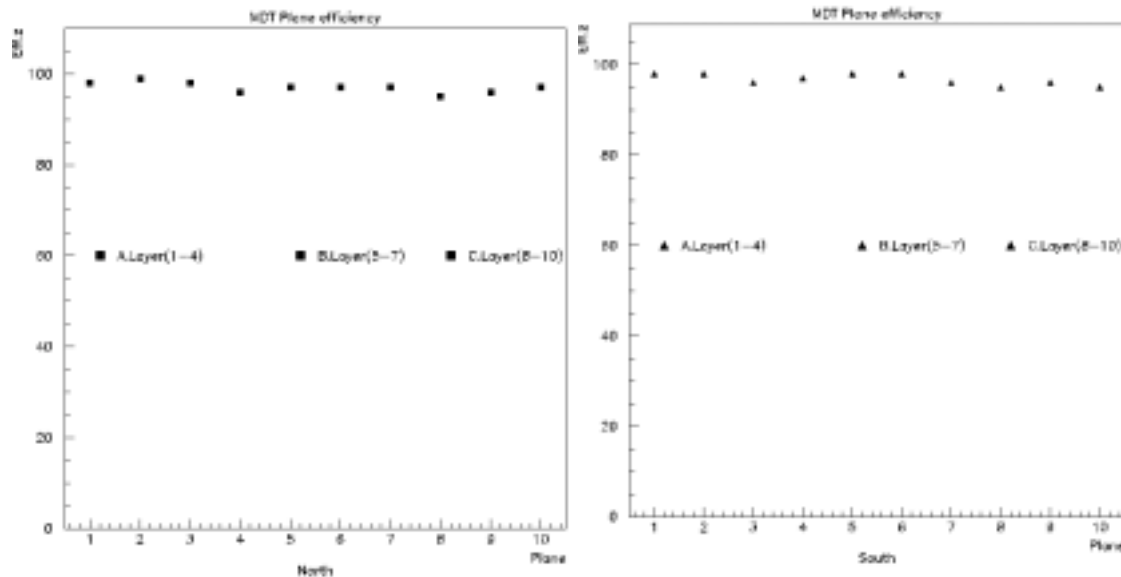
**Timing (Dec-May)**



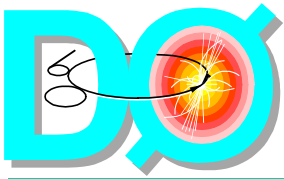


## Forward Muon Tracker (MDT)

- 50,000 channels mini-drift tube based system is operating smoothly
  - ◆ efficiency of drift cells is  $>98\%$
  - ◆ total number of dead channels is 0.5%
  - ◆ used for off-line muon track reconstruction (soon L1, L2 and L3 triggering)
  - ◆ no radiation aging concerns to well above  $15\text{fb}^{-1}$

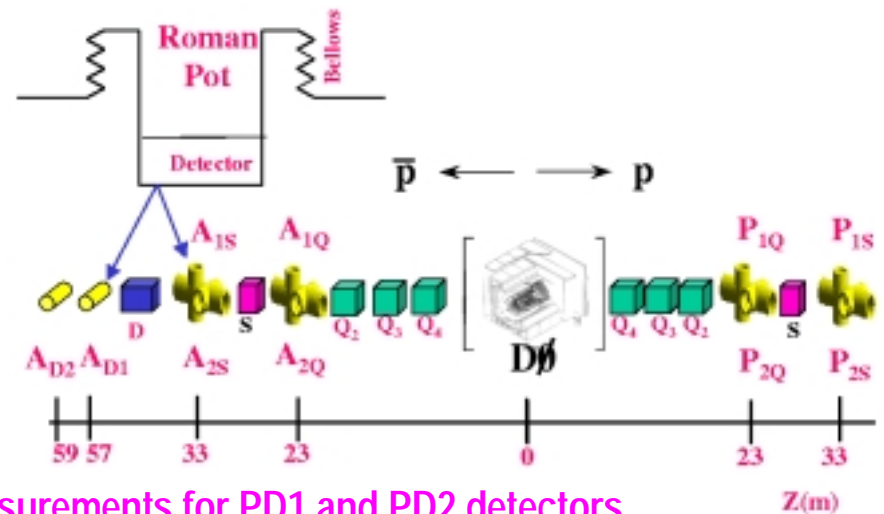


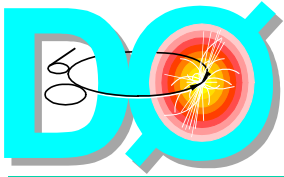




# FPD Commissioning

- Routinely insert pots during collisions
- Timed in with TFW with single coalesced proton bunches
  - ◆ Working on rapidity gap + jet triggers and FPD scintillator trigger AND/OR terms
- Have recorded > 2 million events with elastic trigger using stand-alone DAQ
  - ◆ Data analysis underway
  - ◆ have preliminary efficiency and resolution measurements for PD1 and PD2 detectors
- Upgrade stand-alone trigger for elastic and diffractive triggers with different spectrometers
- Working on sDAQ and FPD integration: one spectrometer (1 AFE) readout starting in May
- In June shutdown install multiplexor, allows simultaneous 18 pot control, more diagnostics, liberate a few rack monitors
- Also in shutdown, attempt to repair small vacuum leak at A2U bellows (may disable one spectrometer until fall shutdown for repairs)
- Installation of readout chain for Phase I by June/July (trigger in July/August)
  - ▲ 10 detectors / 5 spectrometers (requires 3 AFE's)





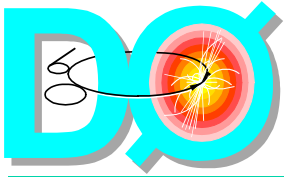
# Conclusions

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- Many things are working very well
- However there are many new systems and capabilities turning on in the next few months
  - ◆ Need to disrupt current operating status minimally while we improve things
- An exciting time to be in the Control Room
- If you're not there already...

**Come join us!**





# L1 Muon Trigger

- Central and Forward scintillator triggers only with MDT centroids readout
- All 5 MCEN and 4 L1Muo crates being readout
- Verification of hardware and data through simulator  $< 1\%$
- Occasional glitch in readout and synchronization problems (requires SCL reset)
- Replacement ten-wire flavor boards with improved BGA layout in early June
- Focusing on improving trigger algorithms and working on new firmware
- PDT centroid triggers by May
- Scintillator triggers with L1CFT starting in May
- Muon shifters monitor trigger rates in the Control Room
- Working on examines output

